REMARKS

Prior to addressing the individual grounds of rejection, the unique features of Applicant's invention are discussed to aid in understanding the claim amendments and remarks provided in this response.

A novel feature of Applicant's invention is that the electroplating of the P2 pole tip is accomplished utilizing a seed layer that is fabricated upon the sidewall of the P2 pole tip. As a result, Applicant's P2 pole tip is electroplated sideways, rather than from the bottom upwards. Thus, the width of the P2 pole tip trench in Applicant's invention does not determine the width of the pole tip, and the width of Applicant's P2 pole tip is controlled by the duration (and other parameters) of the electroplating step.

In prior art pole tips, the width of the P2 pole tip is determined by the width of the photoresist trench, where the pole tip is plated from the bottom of the trench upwards.

Therefore, the method by which Applicant's pole tip is fabricated (sideways electroplating) is distinctly different from the method by which the prior art pole tips are fabricated (upward electroplating). However, the claims that are being prosecuted in this application are apparatus claims, and in these claims, and the amendments to the claims set forth herein, Applicant seeks to structurally differentiate its P2 pole tip from those taught in the prior art.

As is argued in detail herebelow, a significant structural difference, which is the focus of some of the claim amendments herein, is that Applicant's P2 pole tip seed layer is an integrally formed seed layer that is deposited to form both the base and a sidewall of the P2 pole tip. Additionally, another difference is that Applicant's P2 pole tip material is plated upon the sidewall seed layer. The prior art neither teaches nor renders obvious such a structure, as is next described in detail with regard to the claim rejections.

In paragraph 1 of the Office Action claims 19-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Ohtsuka et al (US 5,774,308), stating:

> "With regard to claim 19, Ohtsuka et al shows a magnetic head in Fig. 7 including: a substrate 21; a read head 22 (Column 7, line 47) being fabricated upon the substrate; a P1 pole 24 (Column 7, line 37) being fabricated upon the read head; a write gap layer 27 being fabricated upon the P1 pole; a P2 pole tip 26 being fabricated upon portions of the write gap layer, wherein the P2 pole tip

includes a base surface 26c that is disposed upon the write gap layer 27 and a side wail surface 26b that is disposed generally perpendicularly to the base surface, and wherein the base surface and the side wail surface are comprised of a P2 pole tip seed layer material FeN.

With regard to claim 20, Ohtsuka et al further shows that the base surface defines a width W of the P2 pole tip and the sidewall defines a thickness t of the P2 pole tip.

With regard to claim 21, Ohtsuka further shows that the P2 pole tip further includes an electroplated material portion 26a, and wherein the electroplated (Column 6, lines 24-26) material portion is formed in part upon the sidewall surface seed layer material."

Responsive hereto Applicant has amended claim 19 to recite structural limitations that are not taught by Ohtsuka '308. Specifically, Applicant has amended claim 19 to positively recite the structural limitation that Applicant's P2 pole tip seed layer is an integrally formed layer that comprises both the base surface and a sidewall surface of the P2 pole tip. As Applicant has described hereabove, Applicant's integrally formed seed layer is created prior to the electroplating of the P2 pole tip material, such that the P2 pole tip material can be sideways plated rather than plated from the bottom up.

In its various embodiments, Ohtsuka '308 teaches a P2 pole tip that is plated from the bottom up within a photoresist trench. With particular reference to Fig. 7, and Figs. 8A-E, it is seen that a seed layer 26c is deposited (Fig. 8), followed by the fabrication of a patterned photoresist wherein the P2 pole tip 26a is fabricated into the photoresist trench (col. 7, lines 63-65). Thereafter, the photoresist is removed (Fig. 8C) and ion milling is conducted, which results in the redeposition of seed layer material 26b upon the sides of the previously plated P2 pole tip 26a (col. 8, lines 2-3). Thereafter, the pole tip structure is encapsulated (Fig. 8E). Therefore, a significant structural difference, as set forth in Applicant's amended claim 19, is that Applicant's seed layer is integrally formed, whereas the P2 pole tip of Ohtsuka '308 includes a first deposited base seed layer 26c, and where second portions of the seed layer material are subsequently redeposited upon the sidewalls of the P2 pole tip that has previously been plated up upon the base seed layer 26C. Ohtsuka therefore does not teach an integrally formed base plus sidewall seed layer.

Applicant therefore respectfully submits that Ohtsuka '308 neither teaches nor renders obvious Applicant's base plus sidewall integrally formed seed layer as set forth in claim 19. Applicant therefore respectfully submits that amended claim 19 recites limitations that are not

anticipated by the teachings of Ohtsuka '308, and that this ground of rejection of claim 19 has been satisfied.

With regard to claim 20, Applicant urges that claim 20 is allowable in that it depends from an allowable base claim, amended independent claim 19.

With regard to claim 21, Applicant respectfully traverses the comment above regarding Ohtsuka stating: "...and wherein the electroplated (column 6, lines 24-26) material portion is formed in part upon the sidewall surface seed layer material." Specifically, Ohtsuka teaches the opposite of the comment; that is, Ohtsuka teaches that the sidewall surface seed layer material is redeposited upon the previously electroplated material portion 26a of the P2 pole tip. See Figs. 8B, C and the description in column 8, lines 2-3.

Regarding Applicant's amended claim 21 it is set forth that the pole tip material is plated in part upon the sidewall surface seed layer material. As argued above, Ohtsuka teaches oppositely in showing the redeposition of the seed layer material upon the previously electroplated pole tip material. Applicant therefore respectfully submits that claim 21 recites patentable subject matter. Additionally, Applicant alternatively urges that claim 21 is allowable in that it depends indirectly from an allowable base claim (amended independent claim 19).

In paragraph 2 of the Office Action the prior rejection of claims 1-10 is repeated, that claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Honjo et al (US 6,466,416), stating:

> "With regard to claims 1 and 6, Honjo et al shows a magnetic head (Figs. 3 and 4) including: a substrate 1; a read head 4 being fabricated upon the substrate; a P1 pole 6 being fabricated upon the read head; a write gap layer 7 being fabricated upon the P1 pole; a P2 pole tip 11 being fabricated upon portions of the write gap layer, wherein the P2 pole tip includes a first portion (front portion) being comprised of a magnetic layer material 14 (Fig. 4; column 9, lines 19-22) and a second portion 11 being comprised of electroplated material (Column 9, lines 22-25), and wherein the P2 pole tip has a width dimension W that is formed in part from a thickness of the seed layer material portion and in part from a thickness of the electroplated material portion (Fig. 4).
>
> With regard to claim 6, Honjo et al further shows the magnetic head is used for a hard disk drive (Column 1, lines 6-7) inheriting at least one hard disk being fabricated for rotary motion upon a disk drive; at least one magnetic head adapted to fly over the hard disk for writing data on the hard disk.
>
> Honjo et al does not name layer 14 as seed layer.
>
> However, it would have been obvious at the time the invention was made to one of ordinary skill in the art to recognize that layer 14 is also a seed layer.

The rationale is as follows: Honjo et al teaches that layer 14 is formed by physical vapor deposition (which is not electroplating) (Column 9, lines 62-53) and used for supplying electric current when third layer 11 is formed by electroplating method (Column 9, lines 19- 21); therefore, the layer 14 functions as a seed layer. One of ordinary skill in the art would have been motivated by Honjo et al's teaching to recognize layer 14 as a seed layer.

With regard to claims 2 and 7, Honjo et al further shows the first portion of the P2 pole tip that is comprised of the seed layer material 14 forms a sidewall of the P2 pole tip.

With regard to claims 3 and 8, Honjo et al further shows the seed layer material 14 is formed with a thickness of 100 A (column 12, lines 3 1-32), which is approximately 50 Å to approximately 500 Å, and the electroplated material 11 is formed with a thickness of 5000 Å (Column 12, lines 43-44).

With regard to claims 4 and 9; Honjo et al further shows the electroplated material 11 having thickness of 1000 Å or more (Column 12, line 5 1-52), which is approximately 1500 Å; and the seed layer material thickness is more than 50 Å and less 1000 Å (Column 12, lines 33-42), but does not show it is approximately 250 Å.

However, it would have been obvious at the time the invention was made to one of ordinary skill in the art to include 250 Å as the thickness of the seed layer. The rationale is as follows: Honjo et al teaches that the seed layer material thickness should falls in the range of more then 50 Å and less 1000 Å for balancing the good layer quality and the writing capability (Column 12, lines 33-42). One of ordinary skill in the art would have been motivated by Honjo et al's teaching to find a suitable thickness through experimentation and optimization, which would include 250 Å.

With regard to claims 5 and 10, Honjo et al further shows that the seed layer material 14 is NiFe, which is comprised of NiFe (Column 12, line 31) and the electroplated material 11 is CoNiFe, which is comprised of NiFe (Column 12, line 42- 43)."

Responsive hereto, and to the teachings of Ohtsuka '308 Applicant has amended claim 1 to recite further limitations that are neither taught by nor obvious from the cited prior art. Specifically, Applicant has amended claim 1 to recite the limitation of an integrally formed seed layer that forms both a base and sidewall of the P2 pole tip. With regard to Honjo '416, it teaches the typical prior art P2 pole tip fabrication method including the deposition of a seed layer, the fabrication of a photoresist trench and the bottom upward plating of the P2 pole tip within the trench. The width of the trench determines the width of the plated up P2 pole tip.

Applicant's invention includes an integrally formed seed layer having a sidewall seed layer portion, where the P2 pole tip is sideways electroplated into a wide photoresist trench. The

width of Applicant's P2 pole tip is not determined the width of that trench. Applicant submits that the integrally formed seed layer limitations now included within claim 1 are neither taught by nor obvious from the cited prior art, such that claim 1 recites patentable subject matter.

With regard to amended independent claim 6, it has been amended to include limitations identical to claim 1, and Applicant therefore urges that claim 6 likewise recites patentable subject matter.

With regard to claims 2 and 7, Applicant urges that the prior art fails to teach or render obvious the feature that the electroplated portion of the P2 pole tip is plated upon a sidewall surface seed layer. Alternatively, Applicant urges that these claims are allowable in that they depend from an allowable base claim.

With regard to dependent claims 3-5 and 8-10, Applicant urges that these dependent claims are allowable in that they depend from an allowable base claim, either directly or indirectly.

In paragraph 3 of the Office Action claims 22 -24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohtsuka et al in view of Honjo et al (US 6,466,416), stating

> "With regard to claims 22 and 23, Ohtsuka et al further shows the seed layer material is formed with a thickness of 0.1 micron (1000 A; column 7, lines 56-58) and the electroplated material having thickness of 3 microns (30000 A; column 7, lines 59- 65); but does not show the seed layer material thickness is approximately 50 A to 500 A (or 250 A) and the electroplated material thickness is approximately 100 A to 5000 A (or 1500 A).
>
> However, Honjo et al shows a magnetic head, wherein the seed layer material 14 is formed with a thickness of 100 A (column 12, lines 3 1-32), which is approximately 50 A to approximately 500 A, and the electroplated material 11 is formed with a thickness of 5000 A (Column 12, lines 43-44).
>
> It would have been obvious at the time the invention was made to one of ordinary skill in the art to include the following rage: the seed layer material thickness is approximately 50 A to 500A (or 250 A) and the electroplated material thickness is approximately 100 A to 5000 A (or 1500 A). The rationale is as follows: Applicant does not specify a particular reason for use this particular thickness. One of ordinary skill in the art would have been determining the suitable thickness through experimentations and optimization. Ohtsuka et al's patent was filed in 1996, which is much earlier than the time this invention was made. Thinning the thickness to upgrade the data rate is a well-known trend in the art. Honjo has taught of using thinner thickness of the layers and teaches that the seed layer material thickness should falls in the range of more then 50 A and less 1000 A for balancing the good layer quality and the writing capability

(Column 12, lines 33-42). One of ordinary skill in the art would have been motivated by Honjo et al's teaching and follow the trend in the art to find a suitable thickness through experimentation and optimization, which would include the following range: the seed layer material is formed with a thickness approximately 50 A to 500A (or 250 A) and the electroplated material thickness is approximately 100 A to 5000 A (or 1500 A).

With regard to claim 24, Ohtsuka et al shows the seed layer material is made of FeN film with high saturation magnetic flux density 012 T (Column 5, lines 49-58) and the electroplated material 26c is made of NiFe (Column 7, lines 56); but falls to show that the seed layer material is comprised of NiFe.

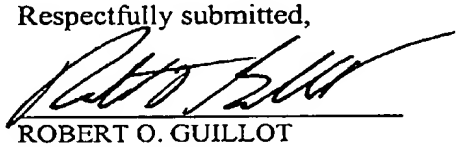
Honjo et al shows that CoNiFe, which is comprised of NiFe, has high saturation magnetic flux density of 1.9-2.2 T (Column 5, lines 18-19).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to include CoNiFe as a candidate for the seed layer. The rationale is as follows: in Ohtsuka et al, the seed layer needs to have high saturation magnetic flux density of 2T, CoNiFe has saturation magnetic flux density of 1.9—2.2 T. One of ordinary skill in the art would have been motivated to include CoFeNi as a material for the seed layer."

With regard to dependant claims 22-24, Applicant urges that these dependent claims are allowable in that they depend from an allowable base claim, either directly or indirectly.

Having responded to all of the paragraphs of the Office Action, and having amended the claims accordingly, Applicant respectfully submits that the Application is now in condition for allowance. Applicant therefore respectfully requests that a Notice of Allowance be forthcoming at the Examiner's earliest opportunity. Should the Examiner have any questions or comments with regard to this amendment, a telephonic conference at the number set forth below is respectfully requested.

Respectfully submitted,



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